Solar Wind Compositional Variations

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Recent in-situ measurements of the composition of the solar wind are providing valuable and often unique new information on origins and processes in the Sun. We review some of the more interesting results and their implications, with emphasis on observations made by the CELIAS collaboration on SOHO.

Fractionation processes present in the upper chromosphere create significant differences in coronal and solar wind elemental abundances relative to photospheric abundances. The differences are not uniform: the effect is smaller in coronal hole-associated "fast" solar wind than in "slow" solar wind. Unusual compositional signatures have been observed in interplanetary coronal mass ejections.

Solar wind isotope studies beyond the light noble gases are now available from high mass resolution sensors. The solar wind reflects the isotopic composition of the outer convection zone of the Sun – the least biased sample remaining of the original interstellar matter that formed the solar nebula 4.6 billion years ago. For volatile elements, solar particles provide the most direct determination of solar abundances. For refractory elements, which can also be reliably inferred from meteoritic samples, deviations observed in the solar wind provide upper limits on the more subtle fractionation processes in the OCZ and solar atmosphere.